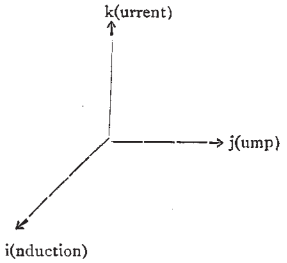
the direction of propulsion, the current urging it will be in the direction of twist in the muscles of the wrist. In treating the movement of a conductor carrying a current in the magnetic field, I have used a rule identical in character with Ampère's, and that was probably the rule to which J. T. B. referred in his critique, namely, that a figure swimming in the current and looking along the lines of force is carried to his left. I should be glad to find a rule at once as complete and more simple, although after a pretty wide experience, not always with the very brightest of pupils, I have not been sorely pressed with the difficulty J. T. B. seems to have felt. All the required attitudes are pretty familiar to a boy who is accustomed to diving in the water and swimming on his front, side, or back. L. CUMMING

Rugby, June 24

THE following version of Ampère's Rule is one which I communicated some time ago to a few friends, but it did not appear to me to be expressed in language sufficiently grave to justify its publication. Still, as the Rule is a simple and useful one, your readers, in general, may be disposed to overlook its levity.

Draw the three well-known Hamiltonian vectors, i, j, k. After i put (nduction), after j put (ump), and after k put (urrent). Then the figure explains the action of magnetic induction on an electric current. The figure in fact asserts that i(nduction) in i makes k(urrent) in k to j(ump) along j.



Of course the same figure gives the direction (according to the Law of Lenz) of the current generated by a motion (*i.e.* a jump) of a conductor in a given direction in a magnetic field in which the direction of the induction is given.

R.I.E. College, Cooper's Hill GEORGE M. MINCHIN

An Earthquake Invention

IN my letter to NATURE, vol. xxxiii. p. 438, I clearly showed that the supposition of Mr. D. A. Stevenson and Prof. Piazzi Smyth that I had endeavoured to claim the aseismatic joint of Mr. D. Stevenson was due to their imperfect acquaintance with seismological literature. I certainly intercalated a *note* about aseismatic structures in a report to the British Association on earthquake phenomena in general, without mentioning Mr. Stevenson's name.

Previous to this, when specially speaking or writing upon aseismic structures, I have *repeatedly* referred to the work of Mr. D. Stevenson. Such references were quoted. Under the circumstances I asked Messrs. Stevenson and Smyth to distinctly state whether they still considered themselves justified in continuing their accusations. If this point was overlooked the discussion might be considered as at an end. Mr. D. A. Stevenson has replied, but the question at issue *has been distinctly evaded* (NATURE, vol. xxxiii. p. 534).

I deeply regret that Messrs. Stevenson and Smyth should allow a discussion to terminate in such a manner.

Tokio, May 22 JOHN MILNE

[This must now close.—ED. NATURE.]

Professor Newcomb's Determination of the Velocity of Light

I HASTEN to correct an error which has crept into my account in last week's NATURE (p. 171) of Prof. Newcomb's measures of the velocity of light. The arrangement employed by Foucault in 1862 was *not* that adopted by Newcomb, and illustrated in Fig. 1, but that sketched in Fig. 2. In other words, he placed his lens between the revolving and fixed mirrors. His apparatus is described in *Comptes rendus*, t. lv. p. 792, where the velocity of the rotating mirror is stated to have been 400 revolutions a second, and the total length of path between the mirrors 20 metres. A. M. CLERKE

June 28

Solar Halo and Sun Pillar seen on June 5, 1886

WHEN approaching the Observatory, about 6.45 p.m., my attention was drawn to portions of a solar halo, which appeared as in Fig. 1.

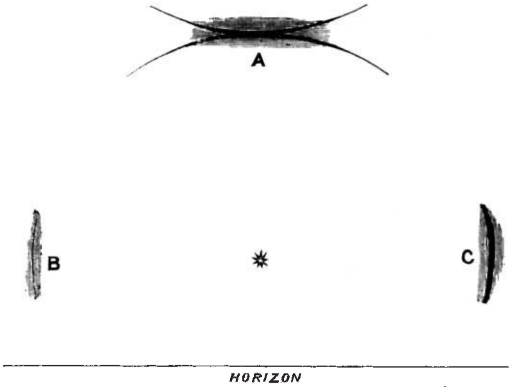


FIG. 1.—A, very bright; C, fainter; B, very faint.

This remained visible until after 7 p.m., and nothing more was seen before 7.30 p.m. When looking out at 7.40 p.m. G.M.T., I noticed something unusual, and came at once to the conclusion that it was a solar pillar, and made a sketch in a note-book and the following remarks:—

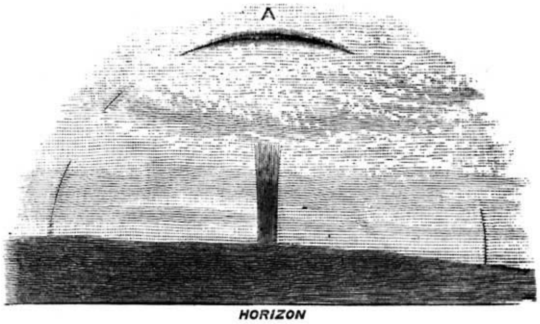


FIG. 2.

The shaded part in the foregoing, other than the halo, pillar, and stratus cloud, represents cirrus.

The pillar apparently rose from the sun, which—when I looked out at 7.40—had just gone below the top of some dark stratus cloud, directly to the upper part of the halo marked A. It was not more than 10° high at the brightest, but quite as much, as I estimated it to reach *nearly* half-way to the portion of the halo A, and the width four times the diameter of the sun. The lower part of the pillar was well defined and of a golden colour; as it approached the halo it gradually became fainter, and was then lost in the cirrus cloud. The upper part was somewhat wider; perhaps this was due to the greater amount of cloud there, which diffused the light.

At 7·55 G.M.T. all portions of the halo had gone except a small piece at A, and the pillar was fainter, but still quite visible. At 8·3 the halo and pillar had disappeared. The sun set at 8·14 p.m.

An ordinary halo (22½°) was visible, more or less bright and complete nearly from sunrise to sunset.

I could not fix the position of the pillar by stars, none near being visible. The sketch was made at the time from a window of the library of the Observatory.

That seen here on 1883 April 6, by Mr. W. A. Robinson, was about 15 minutes *after* sunset; this observation was 30 minutes *before*. The time at which the pillar was visible on the former date was given by nearly all your correspondents as

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15 m. to 45 m. *after* sunset, and in most cases in a cloudless sky; but that on 1886 June 5 was the reverse in both points. Some notes will be found in NATURE, 1883, April and May, for the pillar observed in that year. That seen here partly resembles Fig. 4, Plate III. in *Symons's Meteorological Magazine*, 1871. F. A. BELLAMY

Radcliffe Observatory, Oxford, June 21

The Enemies of the Frog

WHEN living at Mackay, Queensland, I frequently observed that the common house-frogs (*H. cærulea*) were injured in the hind-limbs, and on several occasions I would hear them croaking in pain; but on arrival all I saw would be a wretched exhausted frog weakly hopping away with a wound in the hind-leg, from which the blood would be oozing. Later on I found that rats attack the frogs. The rats catch the frog by the hind-leg, and apparently suck the wound they cause, then let the frog crawl away, attack it and suck it again, and so on until the rat has had enough. I believe the rats suck the blood, because I was never able to discover a frog so attacked on which the flesh had been destroyed.

Mr. W. P. Fletcher, a well-known local naturalist, once gave me the following account of a mantis attacking a frog. It was in the autumn of 1877, at Rockhampton, Queensland. He was "attracted by hearing the noise of a frog in distress, in the daytime, in some garden-shrubs about 6 feet high; he went to see the cause, and found a green frog about 2 inches long. A green mantis about 5 inches long, with one claw had hold of it across the neck, so that the frog could not move, and the mantis was chewing, and did chew off, the hind-leg, the blood flowing profusely." He called Mrs. Fletcher to see them, and then destroyed the mantis, whereon the frog crawled away.

At Lake Elphinstone (100 miles from Mackay) I once found a small frog (*H. rubella*) in the house in a very exhausted condition; on examination I found a large leech on its tongue. This specimen, with the leech attached, I gave to Mr. Boulenger at the British Museum, where it can be seen.

At Mackay the chief enemies of the frogs appeared to be the snakes and the *Agamidæ*. H. LING ROTH

Chronology of Elasticians

IN forming a chronological list of writers on elasticity I have been unable to ascertain the following dates, which I should be much obliged if any of your readers would kindly supply: Mariotte (*né près de Dijon vers* 1620, Marie). Is nothing more definite known as to the date of his birth?

F. E. Neumann	Death years.
W. Weber	
Eaton Hodgkinson	
S. Haughton	Birth years.
J. H. Jellett	

University College, London, June 27 KARL PEARSON

SOLAR METEOROLOGY[1]

SIG. TACCHINI'S detailed report on the various phases of solar activity during the year 1884 deserves, as might be expected from the reputation of its author, most careful attention. Exceptionally fine weather permitted observations of sunspots and faculæ to be made at the Collegio Romano on 307 out of the 365 days, so that the materials accumulated were more than usually abundant. We are thus particularly well informed regarding the symptoms attending the protracted maximum which culminated in February 1884.

This is the more fortunate as that maximum was distinguished by features of special interest. It was delayed considerably beyond the usual term, the interval from the maximum of 1870 being no less than 13·4 in lieu of the normal 11·1 years. And to this delay corresponded a greatly reduced intensity, in accordance with the law by which the undulations of the curve representing spot-frequency are low in proportion as they are long. The maximum of 1884, accordingly, was by much the feeblest which had occurred since 1830. It was moreover a hesitating—it might almost be called an abortive—maximum. Some unknown cause apparently interfered with its due and punctual development. Partial anticipatory outbreaks betrayed the tendency, continually repressed, to complete the cycle at the regular epoch, and with the regular expenditure of energy. Now perturbation—of whatever nature—is always instructive: hence Signor Tacchini's laborious statistical results acquire added significance.

They have been gathered along several closely connected lines of research. The various classes of solar surface-phenomena—spots, faculæ, prominences, metallic eruptions—have been studied apart, and the several resulting inferences as to the progress of solar disturbance subsequently confronted. The trifling discrepancies thus revealed show the mutual dependence of no two such species of commotion to be absolute. Each swells or subsides on the whole without immediate or invariable reference to any other, although under the obvious control of some common underlying cause.

Sunspot activity received a notable accession in the beginning of October 1883, the phase of excitement reaching its acme in the following February,[1] and persisting until the end of May. Since then, some slight oscillations notwithstanding, it has continually declined. The sun was not, however, observed at Rome to be free from spots on a single day in 1884. The maximum for prominences occured in March, and they continued exceptionally numerous down to the end of October. In all, 2714 were delineated and described in 242 observations with the spectroscope, being at the average rate of 11·22 per diem. Sixty metallic eruptions, observed on the same occasions, gave a mean diurnal frequency of 0·248 as against 0·171 for 1883. The richest crop was collected in November 1884, during which month ten eruptions were recorded in sixteen observations. The development of faculæ deviated so markedly from that of spots that their respective fluctuations were at times even inverted. It should also be noted that the mean area per spot in 1884 was of little more than half its value in the preceding year, and that the magnetic instruments at Rome remained throughout comparatively calm

Much valuable information is afforded by Signor Tacchini's careful inquiries as to the distribution on the sun's surface of the different orders of solar phenomena. All these showed, during 1884, a conspicuous prevalence of activity in the southern hemisphere; and the inequality—as appears from a note by the same author presented to the Reale Accademia dei Lincei, March 7, 1886—became still more striking in the ensuing year. No spot was observed in either hemisphere during 1884 at more than 30° from the equator; nor on the northern side, during the latter half of the year, at above 20°. With this contraction of the spotted zone coincided a close approach to the equator of the parallel of maximum frequency; and the usual equatorial minimum was both in 1884 and 1885 very imperfectly maintained.

Prominences were plentifully distributed between 60° north and 50° south latitude, with maxima between 20° and 30°. As during the spot-maximum of 1870, they showed no disposition to avoid the vicinity of the equator; while in 1880, 1881, and 1882, the equatorial minimum of prominences was very marked, and remained perceptible in 1883. Although some rare instances of metallic eruptions were detected in high northern latitudes, they affected chiefly a zone bounded by parallels of 20°. Faculæ occurred predominantly in the same region, and nowhere appeared in latitudes above 50°. On the whole, a concentration towards the equator of the whole range of phenomena was unmistakable, and might be thought to

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[1] "Meteorologia Solare." Note di P. Tacchini. Estratto dagli *Annali della Meteorologia Italiana*, Parte 3, 1884. (Roma: Tipografia Metastasio, 1885.)

[1] M. Rudolf Wolf places the maximum in November 1883.

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